APPENDIX G

Cost Estimates

Source: IT, 1997c (Appendix G)

APPENDIX G

COST ESTIMATES

G.1 Cost Estimates

The following estimates were developed for the purpose of comparing the anticipated cost of each corrective action alternative. The cost estimates are primarily based on generic cost units, vendor information, conventional cost estimating guides, and site-specific conditions. The cost estimates are presented in a manner that allows for evaluating costs of each corrective action alternative developed for groundwater at the POL Area. In addition, costs for the no action alternative are presented for groundwater to provide a baseline for comparison with other alternatives. As no corrective action was deemed necessary for impacted soil at the site, only costs for the no action alternative are presented.

Costs for the corrective action alternatives were developed as follows:

- costs for sitework (i.e., excavation; labor; and treatment system installation, maintenance, and abandonment) are based on the Richardson Rapid System (Process Plant Construction Estimating Standards, Volume 1, Richardson Engineering Services Inc., Mesa, Arizona, 1997)

- costs for sample analysis are based on vendor price catalogs.

Cost Estimates for the Corrective Action Plan Developed for the Petroleum, Oil and Lubricant (POL) Area
Hamilton Army Air Field, Novato, California

I. Impacted Soil Corrective Action Alternatives

A. No Action — $0

1. No costs are associated with this alternative

II. Impacted Groundwater Corrective Action Alternatives

A. No Action — $0

1. No costs are associated with this alternative

B. Natural Attenuation with Groundwater Monitoring

Capital Costs: **$9,378**

1. Deed Restrictions — $1,000
   Assume a $1,000 administrative cost to obtain a deed restriction

2. Natural Attenuation Parameter Analysis — $8,378

   a. Sample Analysis — $2,181
   Assume sampling of existing monitoring wells
   Assume 1.4 samples/well (includes QA samples)
   Assume 7 groundwater monitoring wells for sampling
   Assume each sampling event includes analysis for:
   pH, temperature, conductivity, redox, & dissolved oxygen (tests completed in field)
   Nitrate/nitrite, sulfate, dissolved methane, & alkalinity (tests completed in field lab)

TPH - extractable (Mod. EPA 8015) =	$90	/sample
TPH - purgeable (Mod. EPA 8015) =	$60	/sample
BTEX (EPA 8020) =	$60	/sample
Total (per sample, including 6% EDD surcharge) =	$223	/sample

   b. Labor (for Goundwater Well Sampling) — $1,728
   Assume rate for 2 sampling technicians @ $48 /hour/technician
   Assume 4 hours for decon prior to sampling
   Assume 2 hours/well/sampling event for sampling, shipping, etc.

   c. Rental of Equipment (for Groundwater Well Sampling/Field Analysis) — $1,200
   Assume rental of sampling/field analysis equipment, shipping, etc. @ $400/day
   Assume 7 existing groundwater monitoring wells
   Assume 3 days for sampling

   d. Data Validation — $469
   Assume rate for data validation @ $67/hour
   Assume one hour per sample (one sample per well)

   e. Technical Evaluation of the Analytical Results — $2,800
   Assume rate for 1 engineer @ $70/hour
   Assume 1 work week to conduct natural attenuation parameter evaluation

Operation and Maintenance Costs: **$21,399**

1. Groundwater Monitoring (Semi-annually) $21,399

a. Sample Analysis $4,363

Assume sampling of existing monitoring wells
Assume annual monitoring for 5 years
Assume 1.4 samples/well each sampling event (includes QA samples)
Assume 2 sample event/year
Assume 7 groundwater monitoring wells for sampling
Assume each sampling event includes analysis for:

TPH - extractable (Mod. EPA 8015) =	$90	/sample
TPH - purgeable (Mod. EPA 8015) =	$60	/sample
BTEX (EPA 8020) =	$60	/sample
Total (per sample, including 6% EDD surcharge) =	$223	/sample event

b. Labor (for Goundwater Well Sampling) $1,728

Assume rate for 2 sampling technicians @ $48 /hour/technician
Assume 4 hours for decon prior to sampling
Assume 2 hours/well/sampling event for sampling, shipping, etc.

c. Rental of Equipment (for Groundwater Well Sampling) $750

Assume rental of sampling equipment, shipping, etc. @ $250/day
Assume 7 existing groundwater monitoring wells
Assume 3 days for sampling

d. Labor (for Data Analysis and Validation of Groundwater Data) $2,680

Assume 1 man-week per sampling event
Assume chargeout rate for 1 - Validation Chemist @ $67/hour

e. Labor (for Writing Groundwater Reports) $4,320

Assume 2 man-weeks per report
Assume 1 report per year
Assume rate for 1 engineer @ $54/hour

f. Labor (for Production of Groundwater Reports) $2,400

Assume 1 man-week per report production and review
Assume 1 report per year
Assume rate for production and review staff @ $60/hour

C. In Situ Biodegradation

Capital Costs: **Year 1: $15,680** **Year 10: $1,600**

1. Infiltration Trench Installation $7,274

Assume a CAT 225 Backhoe is used
Assume operator costs included
Assume trench is 400 feet long by 20 feet deep by 5 feet wide
Cost @ $1.78 per cubic yard = $2,637
Mobilization/Demobilization = $1,000
Assume a 100% markup for shoring and inaccessability costs

2. Installation of In Situ System		$500
Assume a 0.3 milli-liter per minute injection pump		
3. Connection of Infiltration Pipe to System		$2,548
Assume	400 linear feet of 4" PVC piping for system	
Assume	$6.37 /linear foot (including labor and materials)	
4. Electrical Utility Hookup		$696
Assume	200 linear feet of 2" conduit and associated cable	
Assume	$3.48 /linear foot (including labor and materials)	
5. Security Fencing Installation		$3,000
Assume	120 linear feet of 8 feet high, chain link fence	
Assume	$25 /linear foot (including labor and materials)	
6. Permanent Overhead Lighting Installation		$1,662
Assume	$733 for 1 - 400 W mercury vapor lamp (labor and materials)	
Assume	$929 for 1 - 20 foot high light pole (labor and materials)	
7. Infiltration Trench Abandonment (Year 10)		$1,600
Assume	400 linear feet	
Assume	$4.00 /linear foot of grouting	
Operation and Maintenance Costs:		**Years 1-10: $47,445**
1. In Situ System		$438
Assume	1 HP pump	
Assume	$0.067 KW/hr	
Cost per hour =	$0.05	
2. Labor (for Weekly Observation/Maintenance)		$39,936
Assume 2 technicians for 8 hours per week		
Assume chargeout rate for 2 technicians @ $48/hour		
3. Liquid Nutrient Additive		$200
Assume general lawn fertilizer to be used		
4. Permanent Overhead Lighting Operation		$631
Assume annual cost (including electricity and lamp replacement)		

5. Groundwater Monitoring (Annually) $21,399 *$40,000

   a. Sample Analysis $4,363
      Assume sampling of existing monitoring wells
      Assume semi-annual monitoring for 5 years
      Assume 1.4 samples/well each sampling event (includes QA samples)
      Assume 2 sample event/year
      Assume 7 groundwater monitoring wells for sampling
      Assume each sampling event includes analysis for:

TPH—extractable (Mod. EPA 8015)	$90/sample
TPH—purgeable (Mod. EPA 8015)	$60/sample
BTEX (EPA 8020)	$60/sample
Total (per sample, including 6% EDO surcharge)	$223/sample event

   b. Labor (for Groundwater Well Sampling) $1,728
      Assume rate for 2 sampling technicians @ $48/hour/technician
      Assume 4 hours for decon prior to sampling
      Assume 2 hours/well/sampling event for sampling, shipping, etc.

   c. Rental of Equipment (for Groundwater Well Sampling) $750
      Assume rental of sampling equipment, shipping, etc. @ $250/day
      Assume 7 existing groundwater monitoring wells
      Assume 3 days for sampling

   d. Labor (for Data Analysis and Validation of Groundwater Data) $2,680
      Assume 1 man-week per sampling event
      Assume chargeout rate for 1 Validation Chemist @ $67/hour

   e. Labor (for Writing Groundwater Reports) $4,320
      Assume 2 man-weeks per report
      Assume 1 report per year
      Assume rate for 1 engineer @ $54/hour

   f. Labor (for Production of Groundwater Reports) $2,400
      Assume 1 man-week per report production and review
      Assume 1 report per year
      Assume rate for production and review staff @ $60/hour

6. Miscellaneous $6,240
   Assume miscellaneous services 10 percent of O&M costs

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* Total cost of annual monitoring was estimated to be $40,000 per year based on February 7, 2003 communication with Mr. Raymond Zimny, U.S. Army Corps of Engineers, Sacramento, CA.

PRESENT WORTH CALCULATIONS

IMPACTED SOIL - NO ACTION ALTERNATIVE

ANNUAL DISCOUNT RATE = 5%

YEAR	CAPITAL COST	O&M COST	DISCOUNT FACTOR	ANNUAL EXPENDITURE	PRESENT WORTH
0	$0	$0	1.0000	$0	$0
1	$0	$0	0.9524	$0	$0
2	$0	$0	0.9070	$0	$0
3	$0	$0	0.8638	$0	$0
4	$0	$0	0.8227	$0	$0
5	$0	$0	0.7835	$0	$0
6	$0	$0	0.7462	$0	$0
7	$0	$0	0.7107	$0	$0
8	$0	$0	0.6768	$0	$0
9	$0	$0	0.6446	$0	$0
10	$0	$0	0.6139	$0	$0
TOTALS	$0	$0			$0

TOTAL COST OF NO ACTION ALTERNATIVE ***$0***

IMPACTED GROUNDWATER - NO ACTION ALTERNATIVE

ANNUAL DISCOUNT RATE = 5%

YEAR	CAPITAL COST	O&M COST	DISCOUNT FACTOR	ANNUAL EXPENDITURE	PRESENT WORTH
0	$0	$0	1.0000	$0	$0
1	$0	$0	0.9524	$0	$0
2	$0	$0	0.9070	$0	$0
3	$0	$0	0.8638	$0	$0
4	$0	$0	0.8227	$0	$0
5	$0	$0	0.7835	$0	$0
6	$0	$0	0.7462	$0	$0
7	$0	$0	0.7107	$0	$0
8	$0	$0	0.6768	$0	$0
9	$0	$0	0.6446	$0	$0
10	$0	$0	0.6139	$0	$0
TOTALS	$0	$0			$0

TOTAL COST OF NO ACTION ALTERNATIVE ***$0***

IMPACTED GROUNDWATER - NATURAL ATTENUATION ALTERNATIVE

ANNUAL DISCOUNT RATE = 5%

YEAR	CAPITAL COST	O&M COST	DISCOUNT FACTOR	ANNUAL EXPENDITURE	PRESENT WORTH
0	$9,378	$0	1.0000	$9,378	$9,378
1	$0	$21,399	0.9524	$21,399	$20,380
2	$0	$21,399	0.9070	$21,399	$19,409
3	$0	$21,399	0.8638	$21,399	$18,484
4	$0	$21,399	0.8227	$21,399	$17,605
5	$0	$21,399	0.7835	$21,399	$16,766
6	$0	$21,399	0.7462	$21,399	$15,968
7	$0	$21,399	0.7107	$21,399	$15,208
8	$0	$21,399	0.6768	$21,399	$14,483
9	$0	$21,399	0.6446	$21,399	$13,794
10	$0	$21,399	0.6139	$21,399	$13,137
TOTALS	$9,378	$213,990			$174,613

TOTAL COST OF NATURAL ATTENUATION ALTERNATIVE ***$174,613***

IMPACTED GROUNDWATER - IN-SITU BIODEGRADATION ALTERNATIVE

ANNUAL DISCOUNT RATE = 5%

YEAR	CAPITAL COST	O&M COST	DISCOUNT FACTOR	ANNUAL EXPENDITURE	PRESENT WORTH
0	$15,680	$0	1.0000	$15,680	$15,680
1	$0	$47,445	0.9524	$47,445	$45,187
2	$0	$47,445	0.9070	$47,445	$43,033
3	$0	$47,445	0.8638	$47,445	$40,983
4	$0	$47,445	0.8227	$47,445	$39,033
5	$0	$47,445	0.7835	$47,445	$37,173
6	$0	$47,445	0.7462	$47,445	$35,404
7	$0	$47,445	0.7107	$47,445	$33,719
8	$0	$47,445	0.6768	$47,445	$32,111
9	$0	$47,445	0.6446	$47,445	$30,583
10	$1,600	$47,445	0.6139	$49,045	$30,109
TOTALS	$17,280	$474,452			$383,015

TOTAL COST OF IN-SITU BIODEGRADATION ALTERNATIVE ***$383,015***

Task Level Summary:
Task 159892.08.PL.CR is currently ACTIVE. The task is managed by STUHR, CATHLEEN ANN.. The task is 25.19% spent (direct) and 0.00% complete (direct). The task is currently **open** to labor charges and is **open** to expense charges.

Performance	Current Month	Last Month	PJTD	Budget
Direct Labor	$.00	$296.33	$4,360.78	$17,760.00
Direct Expense	$.00	$71.50	$919.31	$3,205.00
Total Direct Cost	$.00	$367.83	$5,280.09	$20,965.00
Total Indirect Cost	$.00	$274.38	$4,005.26	$16,037.01
Labor Hours	0.0	10.0	131.6	
Memo: Non-Billable Direct Cost	$.00	$.00	$.00	
Memo: Net Asset Charge	$.00	$.00	$.00	
Committed Accrued Cost			$.00	
Original Commitment			$.00	
Revised Commitment			$.00	
Committed Invoiced Cost			$.00	
ETC Commitment			$.00	

Budget Information

Total Direct Labor — 17 760
Direct Exp — 3 205
Total Direct Cost Budget — 20 965
Total Indirect Cost Budget — 16 037.01

9 285.35 / 37 002.01 = 25.09% spent

April Activities

- Prepare draft for review by Cathy Stuhr by incorporating edits from Steve Long and revising figures. 10 hrs for Ben Moayyad

Note: all drafting costs for 159892.08.PL.CR and ___ 08.PL.CA have be

% completion on report 35-40% ?

Labor Hours Summary: Task 159892.08.PL.CR

Click on the Employee Number to drill into financials or switch to COST view

Employee		Hours			
Number	Name	Current Month	Last Month	YTD	PJTD
33426	Moayyad, Behnaum	0.0	10.0	85.0	107.0
13972	Long, Steven Patrick	0.0	0.0	4.0	12.0
30096	Stuhr, Cathleen Ann	0.0	0.0	3.0	7.0
17743	Michaelis- Rambin, Nancy	0.0	0.0	0.0	4.6
30241	Antel, Robert J	0.0	0.0	0.5	0.5
31035	Johnson, Alice M	0.0	0.0	0.0	0.5

Task Level Summary:
Task 159892.08.PL.CA is currently ACTIVE. The task is managed by STUHR, CATHLEEN ANN.. The task is 44.92% spent (direct) and 0.00% complete (direct). The task is currently **open** to labor charges and is **open** to expense charges.

Performance	Current Month	Last Month	PJTD	Budget
Direct Labor	$63.27	$1,928.04	$8,305.78	$18,152.00
Direct Expense	$5.40	$291.54	$1,499.71	$3,675.00
Total Direct Cost	$68.67	$2,219.58	$9,805.49	$21,827.00
Total Indirect Cost	$58.59	$1,641.99	$6,782.58	$16,390.99
Labor Hours	1.0	50.1	200.5	
Memo: Non-Billable Direct Cost	$.00	$.00	$.00	
Memo: Net Asset Charge	$.00	$.00	$.00	
Committed Accrued Cost			$.00	
Original Commitment			$1,200.00	
Revised Commitment			$305.00	
Committed Invoiced Cost			$305.00	
ETC Commitment			$.00	

Budget Information

Total Direct Labor 18 152
Direct Exp 3 675
21 827
16 390.99

Direct 9736.82
Indirect 6723.99
16 460.81
38 217.99
43.07% Spent

April Activities

- Incorporated edits from Cathy Stuhr
- Finalize figures
- Draft section describing exit strategy for natural attenuation remedial alternative

% completion on report 50%

Labor Hours Summary: Task 159892.08.PL.CA

Click on the Employee Number to drill into financials or switch to COST view

Employee		Hours			
Number	Name	Current Month	Last Month	YTD	PJTD
30094	Kieu, Nghi Van	0.0	16.0	99.0	99.0
13972	Long, Steven Patrick	0.0	12.0	41.0	53.0
33027	Clymo, Amelia Susanne	0.0	18.0	23.0	23.0
30096	Stuhr, Cathleen Ann	0.0	1.0	5.0	7.0
17743	Michaelis- Rambin, Nancy	0.0	0.0	0.0	4.1
31500	Pritchard, Heather Jeanne	0.0	0.0	0.0	4.0
2276	Campfield, Paul Clayton	0.0	0.0	3.0	3.0
32140	Glover, Shannon L	0.0	2.4	2.4	2.4
18218	Wells, Eric Jason	0.0	0.0	0.0	2.0
2877	Elliott Jr, Charles S	1.0	0.0	1.0	1.0
33426	Moayyad, Behnaum	0.0	0.0	0.0	1.0
16960	Eilert, Brad W	0.0	0.5	0.5	0.5
13965	Horton, Doris Ann	0.0	0.0	0.3	0.3
31035	Johnson, Alice M	0.0	0.2	0.2	0.2